



Cor3-2011 - Rethinking Nitrogen Losses - 2011

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Rethinking Nitrogen Losses - 2011

Purpose:

The purpose was to explore techniques for evaluating N losses from various forms of N and application strategies. This work focused on losses from ammonia volatilization, and continues from work started in 2010.

Methods:

Ammonia losses associated with different methods of applying UAN at side-dressing time were investigated in conjunction with Ridgetown Diagnostic Days, Elora FarmSmart Expo and Eastern Ontario Crop Diagnostic Days. In 2010, surface, shallow and standard UAN side-dressing were evaluated in Ridgetown and Winchester. In 2011, surface applications of UAN by flat fan, streamer and banding nozzles were investigated. The approach to measuring ammonia loss is relatively simple and has been developed by Dr. John Lauzon and his graduate students at the University of Guelph. After nitrogen application, the zone is immediately covered with a chamber (full of holes) to somewhat trap the ammonia; in our case we used blue recycling bins (Figure 1). Inside the chamber is a small glass vial which is packed with a material that reacts with the ammonia and produces a colour change indicating the amount of ammonia released into the chamber. The vials are read periodically and give a cumulative total over time, which is proportional to actual losses.



Figure 1. Ammonia loss measurement chamber

Results:

When evaluating ammonia loss from UAN injection at side-dressing, the losses from standard injection (3-4" deep) were very low while the surface applied and shallow injection (1") resulted in very high N losses (Table 1). These results are conveyed as an N-loss index, which in this case is the N loss rating compared the surface side-dress treatment set at 100. In the surface application and the shallow injection treatment, the UAN was not covered by soil and was thus susceptible to ammonia volatilization. In the case of shallow injection, which simulates a poor injection method, UAN was still visible in the trench which had not been sufficiently closed, which likely contributed to it being no better than the surface application.

Table 1. Ammonia volatilization related nitrogen loss response for different UAN side-dressing methods in June 2010 in Ridgetown and Winchester, Ontario

Side-dress Method	N-Loss Index (%)
UAN Side-dress surface	100
UAN Side-dress Shallow (1")	112
UAN Side-dress Standard (3-4")	6

This work in 2010 where the uncovered, concentrated band of UAN had surprisingly high ammonia losses inspired us to further test UAN application techniques in 2011. In 2011 we compared flat fan, streamer nozzles and single band nozzles. There appeared to be no reduction in N volatilization when the UAN was applied in a more concentrated band. In fact on the bare soil it generally appeared that spraying the UAN with a flat fan resulted in less N loss than either streamers or a single concentrated band (Table 2.). In Ridgetown, corn plots were comprised of a conventional as well as a mulch tillage system where corn residue was present on the soil surface. Surface applications on the residue resulted in much higher losses relative to the conventional till, and also resulted in little difference between the different nozzle types.

Table 2. Ammonia volatilization associated nitrogen losses with different nozzle selections for the application of UAN.

Nozzle	Elora	Ridgetown	
	Conv. Till	Conv. Till	Mulch Till
	----- N-Loss (lb-N/ac) -----		
Flat Fan	10	7	37
Streamer	34	13	31
Band	19	15	43

Summary:

1) Side-dressing of UAN with poor covering of the UAN by the side-dress applicator did result in much higher N losses than correct injection. Our numbers clearly suggest that it is worth the time to get the coulters and injectors working properly to cover the UAN.

2) For producers who would rather surface apply UAN through a sprayer it appears that concentrating the UAN via streamer nozzles or a single band may actually increase the potential loss of N via ammonia volatilization. Note that this applies to situations where the crop is small enough (less than 3 leaf corn) so that crop damage is not an issue. On taller corn streamer nozzles are recommended to reduce crop injury.

Next Steps:

Work will be repeated in future experiments to confirm differences between application methods, and to arrive at more reliable estimates of actual N loss.

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